

In the Claims:

Claims 23 and 24 have been amended herein. Claims 25-36 have been added. A complete listing of the claims with appropriate claim identifiers is set forth below.

Listing of Claims:

1-7. (Canceled)

8. (Previously presented) The method according to claim 19, wherein the diazotization/chloro-dediazoniatio n reaction is performed at or less than a temperature of 0° C.

9. (Canceled)

10. (Previously presented) The method according to claim 20, wherein replacing the 2-amino group of the product of step (a) with a 2-chloro group is performed at or less than a temperature of 0° C.

11. (Canceled)

12. (Previously presented) The method according to claim 21, wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed at or less than a temperature of 0° C.

13. (Canceled)

14. (Previously presented) The method according to claim 22, wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed at or less than a temperature of 0° C.

15. (Canceled)

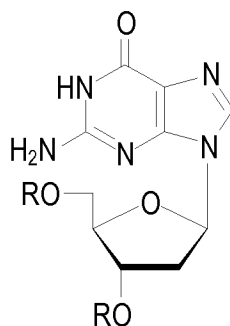
16. (Previously presented) The method according to claim 23, wherein replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group is performed at or less than a temperature of 0° C.

17. (Canceled)

18. (Previously presented) The method according to claim 24, wherein reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group is performed at or less than a temperature of 0° C.

19. (Previously presented) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) converting the 6-oxo group of a compound having the formula



wherein R is a protecting group, into a 6-(substituted oxy) group having sufficient reactivity in an S_NAr displacement reaction;

(b) replacing the 2-amino group with a 2-chloro group by a diazotization/chloro-dediazoniation reaction;

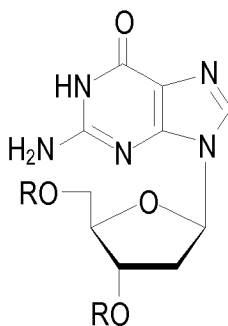
(c) replacing the 6-(substituted oxy) leaving group with a 6-amino group; and

(d) removing the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group with a 2-chloro group by a diazotization/chloro-dediazoniation reaction is performed using acetyl chloride and benzyltriethylammonium nitrite.

20. (Previously presented) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) converting the 6-oxo group of a compound having the formula



wherein R is a protecting group, into a 6-(substituted oxy) leaving group selected from the group consisting of (alkyl or any substituted alkyl or cycloalkyl) sulfonyl, phosphoryl or phosphonyl groups, (aryl or any substituted aryl)sulfonyl, phosphoryl or phosphonyl groups;

(b) replacing the 2-amino group of the product of step (a) with a 2-chloro group;

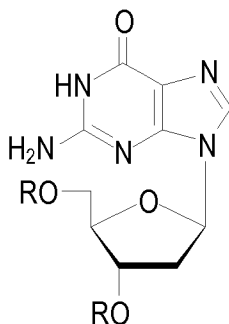
(c) replacing the 6-(substituted oxy) leaving group of the product of step (b) with a 6-amino group; and

(d) removing the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group of the product of step (a) with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

21. (Previously presented) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group, with reagents selected from the group consisting of (alkyl or any substituted alkyl or cycloalkyl)sulfonyl, phosphoryl or phosphonyl reagents and (aryl or any substituted aryl)sulfonyl, phosphoryl or phosphonyl reagents to produce a 6-O-(alkyl, substituted alkyl, cycloalkyl, aryl, or substituted aryl)sulfonyl, phosphoryl or phosphonyl group that is capable of hindering nucleophilic attack at the sulphonyl sulfur, phosphoryl or phosphonyl phosphorous and promoting nucleophilic attack at C6 upon subsequent ammonolysis;

(b) reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group;

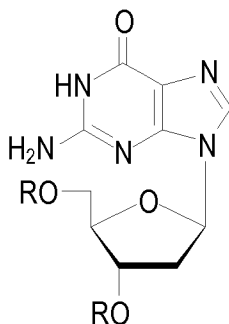
(c) reacting the product of step (b) with a nitrogen source in a solvent compatible with the nitrogen source to replace the 6-(substituted oxy) leaving group with a 6-amino group; and

(d) reacting the product of step (b) or step (c) with a nitrogen source in a solvent compatible with the nitrogen source to remove the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

22. (Previously presented) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

- (a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group, with a halogen compound, to produce a 6-halo leaving group;

- (b) reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group;

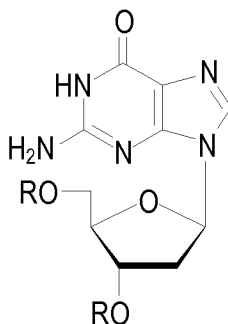
- (c) reacting the product of step (b) with a nitrogen source in a solvent compatible with the nitrogen source to replace the 6-halo leaving group with a 6-amino group by selective ammonolysis of the 6-leaving group; and

- (d) reacting the product of steps (b) or (c) with a nitrogen source in a solvent compatible with the nitrogen source to remove the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

23. (Currently amended) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

- (a) converting the 6-oxo group of a compound having the formula



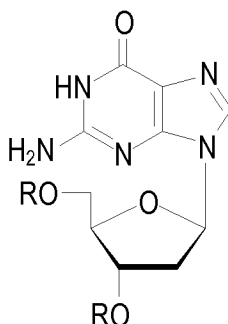
wherein R is a protecting group selected from the group consisting of acetyl, and benzoyl, into a 6-leaving group having lesser reactivity than that of the 2-amino group in a diazotization/chloro-dediazoniation displacement reaction;

- (b) replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group;
- (c) replacing the 6-leaving group with a 6-amino group by selective ammonolysis of the 6-leaving group; and
- (d) removing the R protecting groups by deacylation, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group is performed using acetyl chloride and benzyltriethylammonium nitrite.

24. (Currently amended) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

- (a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, with an (alkyl or any substituted ~~alkyl~~ alkyl or cycloalkyl) sulfonyl or phosphoryl reagent or (aryl or any substituted aryl) sulfonyl or phosphoryl reagent to convert the 6-oxo group to a 6-O-(alkyl, cycloalkyl, or aryl) sulfonyl or phosphoryl group;

(b) reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoni-ation of the 2-amino group;

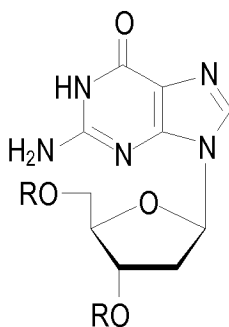
(c) reacting the product of step (b) with ammonia in a compatible solvent, or with a nitrogen source capable of being converted to an amino group in a solvent compatible with the nitrogen source, to replace the 6-leaving group with a 6-amino group; and

(d) reacting the product of step (c) with a basic reagent in a compatible solvent to remove the R protecting groups by deacylation, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoni-ation of the 2-amino group is performed using acetyl chloride and benzyltriethylammonium nitrite.

25. (New) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) converting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, into a 6-(substituted oxy) group having sufficient reactivity in an S_NAr

displacement reaction wherein the 6-(substituted oxy) group is selected from the group consisting of alkylsulfonyl, arylsulfonyl, and chloride;

(b) replacing the 2-amino group with a 2-chloro group by a diazotization/chloro-dediazoniatio

(c) replacing the 6-(substituted oxy) leaving group with a 6-amino group; and

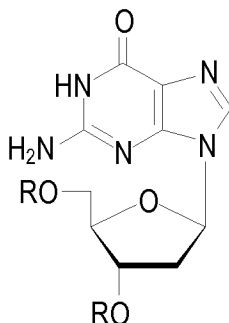
(d) removing the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group with a 2-chloro group by a diazotization/chloro-dediazoniatio

26. (New) The method according to claim 25, wherein the diazotization/chloro-dediazoniatio

27. (New) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) converting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, into a 6-(substituted oxy) leaving group selected from the group consisting of (alkyl or fluoroalkyl or cycloalkyl) sulfonyl, phosphoryl or phosphonyl groups, (aryl or 4-methylbenzene or 2,4,6-triisopropylbenzene)sulfonyl, phosphoryl or phosphonyl groups;

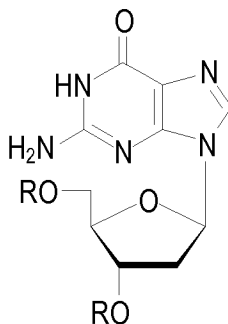
- (b) replacing the 2-amino group of the product of step (a) with a 2-chloro group;
- (c) replacing the 6-(substituted oxy) leaving group of the product of step (b) with a 6-amino group; and
- (d) removing the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group of the product of step (a) with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

28. (New) The method according to claim 27, wherein replacing the 2-amino group of the product of step (a) with a 2-chloro group is performed at or less than a temperature of 0° C and sufficient to carry out the reaction.

29. (New) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

- (a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, with reagents selected from the group consisting of (alkyl or fluoroalkyl or cycloalkyl)sulfonyl, phosphoryl or phosphonyl reagents and (aryl or 4-methylbenzene or 2,4,6-triisopropylbenzene)sulfonyl, phosphoryl or phosphonyl reagents to produce a 6-O-(alkyl, substituted alkyl, cycloalkyl, aryl, or substituted aryl)sulfonyl, phosphoryl or phosphonyl group that is capable of hindering nucleophilic attack at the sulphonyl sulfur, phosphoryl or phosphonyl phosphorous and promoting nucleophilic attack at C6 upon subsequent ammonolysis;

(b) reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group;

(c) reacting the product of step (b) with a nitrogen source in a solvent compatible with the nitrogen source to replace the 6-(substituted oxy) leaving group with a 6-amino group; and

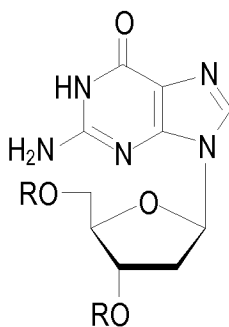
(d) reacting the product of step (b) or step (c) with a nitrogen source in a solvent compatible with the nitrogen source to remove the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

30. (New) The method according to claim 29, wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed at or less than a temperature of 0° C and sufficient to carry out the reaction.

31. (New) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, with a chloride compound selected from the group consisting of metal chlorides, metal chloride salts, acyl chlorides, sulfonyl chlorides, silyl chlorides,

and alkyl and aryl substituted ammonium chloride salts, to produce a 6-chloro leaving group;

(b) reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group;

(c) reacting the product of step (b) with a nitrogen source in a solvent compatible with the nitrogen source to replace the 6-halo leaving group with a 6-amino group by selective ammonolysis of the 6-leaving group; and

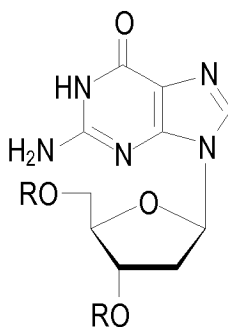
(d) reacting the product of steps (b) or (c) with a nitrogen source in a solvent compatible with the nitrogen source to remove the R protecting groups, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed using acetyl chloride and benzyltriethylammonium nitrite.

32. (New) The method according to claim 31, wherein reacting the product of step (a) with a halide source and a nitrite source in a solvent compatible with the halide source to replace the 2-amino group with a 2-chloro group is performed at or less than a temperature of 0° C and sufficient to carry out the reaction.

33. (New) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

(a) converting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acetyl and benzoyl, into a 6-leaving group having lesser reactivity than that of the 2-amino

group in a diazotization/chloro-dediazoniation displacement reaction selected from the group consisting of alkylsulfonyl, arylsulfonyl, and chloride;

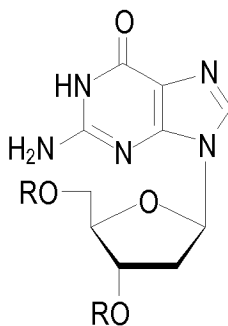
- (b) replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group;
- (c) replacing the 6-leaving group with a 6-amino group by selective ammonolysis of the 6-leaving group; and
- (d) removing the R protecting groups by deacylation, to produce 2-chloro-2'-deoxyadenosine;

wherein replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group is performed using acetyl chloride and benzyltriethylammonium nitrite.

34. (New) The method according to claim 33, wherein replacing the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoniation of the 2-amino group is performed at or less than a temperature of 0° C and sufficient to carry out the reaction.

35. (Previously presented) A method for producing 2-chloro-2'-deoxyadenosine comprising the steps of:

- (a) reacting the 6-oxo group of a compound having the formula



wherein R is a protecting group selected from the group consisting of acyl and silyl, with an (alkyl or fluoroalkyl or cycloalkyl) sulfonyl or phosphoryl reagent or (aryl or 4-methylbenzene or 2,4,6-triisopropylbenzene) sulfonyl or phosphoryl reagent to convert the 6-oxo group to a 6-O-(alkyl, cycloalkyl, or aryl) sulfonyl or phosphoryl group;

(b) reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoni-ation of the 2-amino group;

(c) reacting the product of step (b) with ammonia in a compatible solvent, or with a nitrogen source capable of being converted to an amino group in a solvent compatible with the nitrogen source, to replace the 6-leaving group with a 6-amino group; and

(d) reacting the product of step (c) with a basic reagent in a compatible solvent to remove the R protecting groups by deacylation, to produce 2-chloro-2'-deoxyadenosine;

wherein reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoni-ation of the 2-amino group is performed using acetyl chloride and benzyltriethylammonium nitrite.

36. (New) The method according to claim 35, wherein reacting the product of step (a) with a halide and an organic nitrite in a solvent compatible with the halide to replace the 2-amino group with a 2-chloro group by diazotization/chloro-dediazoni-ation of the 2-amino group is performed at or less than a temperature of 0° C and sufficient to carry out the reaction.